

U.S. Patent Application For

EASILY REMOVED HEATSINK CLIP

By:

Gregory C. Franke
Donald J. Hall
Jeffrey A. Lambert

| | |
|---|--|
| "EXPRESS MAIL" MAILING LABEL | |
| Number: <i>EV 017 056 658 US</i> | |
| Date of Deposit: <i>December 14, 2001</i> | |
| Pursuant to 37 C.F.R. § 1.10, I hereby certify that I am personally depositing this paper or fee with the U.S. Postal Service "Express Mail Post Office to Addressee" service on the date indicated above in a sealed envelope (a) having the above numbered Express Mail label and sufficient postage affixed, and (b) addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231 | |
| Signature: <i>Jennifer Presswood</i> | |
| Printed Name: <i>Jennifer Presswood</i> | |

EASILY REMOVED HEATSINK CLIP

FIELD OF THE INVENTION

The present invention generally relates to the field
5 of mechanical fasteners, and particularly to retention
clips, specifically heatsink retention clips used to anchor
heatsinks to heatsink retainers.

BACKGROUND OF THE INVENTION

10 This section is intended to introduce the reader to
various aspects of art that may be related to various
aspects of the present invention, which are described
and/or claimed below. This discussion is believed to be
helpful in providing the reader with background information
15 to facilitate a better understanding of the various aspects
of the present invention. Accordingly, it should be
understood that these statements are to be read in this
light, and not as admissions of prior art.

20 In the field of computer design, processing chips,
which perform the computational functions of a computer,
typically generate substantial amounts of heat. This heat
must be dispersed from around the chip to prevent
malfunctions. To accomplish this, heatsinks are typically

associated with the chips to provide a structure with high surface area to disperse the heat. As processing chips have grown both faster and hotter, heatsinks have grown proportionately larger and heavier. For example, current
5 heatsinks may weigh more than a half pound to achieve the desired heat dissipating effect.

Retention clips are typically used to secure the heatsink to a heatsink retainer which positions the
10 heatsink relative to the heat generating chip. As heatsinks have grown larger and heavier, the retention clips must in turn be stronger to avoid shifting. If a retention clip is too weak to secure the heatsink during shipping, the heatsink may pull loose, allowing the processing chip to
15 come unseated due to their interface.

In addition to strong retention clips, however, there is also a need to make the clips easy to install and remove. Current clips must either be removed with a
20 screwdriver or other tool or with a release tab or other mechanism requiring the application of significant force even after the release of any locking mechanism. Additionally, the use of release tabs and levers typically

result in retention clips which enlarge or exceed the
heatsink envelope, thereby increasing the footprint of the
assembly and limiting the height of nearby elements. Such
clips are difficult for factory personnel to remove not
5 only due to the need to use a tool within a confined space
to effect removal but also due to the force necessary
remove the stronger clips. Ideally, a retention clip would
require low installation force, would possess high
retention force, and would be easily removable.

10

SUMMARY OF THE INVENTION

The following passage is intended only to provide a
brief summary of limited aspects of the present inventions
and should not be construed as encompassing all necessary
15 elements or steps of the inventions. The present invention
is related generally to overcoming the deficiencies
inherent in previous designs by allowing easy insertion and
removal of a retention clip while providing adequate
retention force. This aim is accomplished by providing
20 designs comprising a simple release generally in the form
of a pinchable release mechanism. Additionally
methodologies are provided which include the act of using a

pinchable release mechanism to effect the release of a
heatsink retention clip.

5

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will hereafter be described with
reference to the accompanying drawings, wherein like
reference numerals denote like elements, and:

10

Figure 1 is a cutaway view of a idealized computer
system including an exploded view of a heatsink assembly;

Figure 2 is a side view of a heatsink retention clip;

Figure 3 is a perspective view of a heatsink retention
clip in the locked position; and

15

Figure 4 is a perspective view of a heatsink retention
clip in the unlocked position.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

It will be appreciated that the present invention can take many forms and embodiments. Some embodiments of the invention are described so as to give an understanding of the invention. It is not intended, however, that the 5 embodiments of the present invention that are described in this specification should limit the invention.

Turning now to the drawings and referring initially to Fig. 1, there is depicted a cutaway, perspective view of an 10 exemplary computer system 10. Computer system 10 comprises a chassis 14 which in turn is comprised of a number of chassis walls 18.

15 In addition, computer system 10 comprises a motherboard 22. Motherboard 22, in turn, comprises a board substrate 26 and components such as central processing unit 30, and memory components 34. Disposed about CPU 30 on motherboard 22 is a heatsink retainer 50. Mass storage 20 device 38 also resides within the chassis and is connected to motherboard 22. In addition, computer system 10 comprises input and output devices such as monitor 42 and keyboard 46.

In the illustrated embodiment, heatsink retainer 50 possesses clip engagements 62 along the edges and generally disposed about the corners. As depicted, each clip engagement 62 is configured to receive a hooked member 94 comprising a part of a retainer clip 58. Alternatively clip engagement 62 may be configured as a projection such that the projection fits into a cutout window comprising a part of retainer clip 58.

10

In computer system 10, heatsink 54 is conformably engaged with retainer 50 such that the bottom of heatsink 54 is in contact with CPU 30. In the preferred embodiment, two retainer clips 58 are disposed along heatsink upper faces 78 and securely engage with clip engagements 62 of retainer 50 via hooked members 94. As depicted in Fig. 1, retainer clip 58 further comprises a cam arm 102 and a removal arm 98 which provide for easy engagement and removal of retainer clip 58 in the limited space of chassis 14.

20

As depicted, the heatsink assembly, comprising heatsink retainer 50 and heatsink 54, defines a three-

dimensional spatial envelope. As illustrated, the addition of retainer clip 58 does not substantially increase the size or change the shape of the envelope. In an exemplary embodiment, the footprint of the envelope is generally square and remains square even after the addition of retainer clip 58.

Figure 2 depicts an embodiment of the retainer clip of the present application. Retainer clip 58 is shown to comprise a clip body 82 of generally elongated nature. Clip body 82 comprises a clip top surface 114 and a clip bottom surface 118. Each end of clip body 82 comprises a retaining arm, a first retaining arm 86 and a second retaining arm 90, projecting downward relative to bottom surface 118. On the distal portion of first retaining arm 86 and second retaining arm 90 are hooked members 94 which serve to engage clip engagement 62. Alternatively, first retaining arm 86 and second retaining arm 90 may comprise cut out windows on their distal portion which engage conforming projections instead of clip engagements 62.

Additionally, clip body 82 comprises a removal arm 98 on one end projecting upward relative to top surface 114.

Removal arm 98 may be a looped structure when clip body 82, first retaining arm 86, second retaining arm 90, and removal arm 98 all comprise a single unitary piece.

5 Retainer clip 58 also comprises a cam arm 102 generally centered along clip body 82. Cam arm 102 has an arm body 130 connected to two arm runners 134 such that each is located on a different side of arm body 130 and configured to span the width of clip body 82. Each runner
10 134 comprises a hinge hole 138 configured to receive a corresponding hinge pin 142 projecting from the side of clip body 82. The coupling on hinge pin 142 and hinge hole 138 allow cam arm 102 to partially rotate relative to clip body 82. Each runner 134 further comprises two pair of
15 aligned, inward facing protrusions a pair of unlock protrusions 146 and a pair of lock protrusions 150. Both unlock protrusions 146 and lock protrusions 150 act to hinder, but not prevent, the free rotation of cam arm 102 relative to clip body 82 effectively preventing rotation of
20 cam arm 102 absent the application of some minimal level of force.

Cam arm 102 may further comprise a lifting member 106 which is configured such that, when cam arm 102 is rotated generally perpendicular to clip body 82, lifting member is angled slightly away from clip body 82. Cam arm 102 also
5 comprises rotation stop 122 configured to prevent rotation of cam arm 102 when cam arm is generally perpendicular to clip body 82.

In the embodiment illustrated in Figure 2, cam arm 102
10 is connected to clip body 82 by hinge hole 138 and hinge pin 142 such that the rotation of cam arm 102 is toward removal arm 98. Rotation stop 122, however, prevents rotation toward removal arm 98 past a point which is generally parallel to removal arm 98 and generally
15 perpendicular to clip body 82.

Referring now to Fig. 3, Retainer clip 58 is shown from a birdseye perspective in a locked configuration which would be typical of normal operation in the preferred
20 embodiment. Longitudinal axis 126 is shown for reference running in the direction of clip body 82. In the locked configuration cam arm 102 is rotated such that it is generally parallel to clip body 82. In this position, lock

protrusions 150 act to impede the free rotation of cam arm 102 from the locked position. A force exceeding some minimum required force must be applied to cam arm 102 to overcome the resistance of lock protrusions 150 when
5 locking or unlocking the cam arm. Additionally, as depicted lifting member 106 and rotation stop 122 each are angled away from top surface 114 of clip body 82 when cam arm 102 is in the locked position.

10 As is also depicted in Fig. 3, in the locked position, runners 134 extend downward along the sides of clip body 82 in the same direction as the retaining arms 86, 90. Thus, referring back to Fig. 1, in the locked position, runners 134 exert force on heatsink upperface 78 and thereby
15 securely hold heatsink 54 against CPU 30. In the locked position, clip bottom surface 118 is therefore not in contact with heatsink upper face 78. In this manner, the mechanical force generated by hinged cam arm 102 in conjunction with the engagement of hooked members 94 with
20 clip engagements 62 allows greater force to be applied in securing heatsink 54 than would be possible in the absence of cam arm 102.

Referring now to Fig. 4, retainer clip 58 is shown from a birdseye perspective in an unlocked configuration which would be typical of removal or insertion in the preferred embodiment. To effect insertion of retainer clip 58, referring also to Fig. 1 for context, it will be presumed that heatsink 54 is disposed in an unsecured manner upon heatsink retainer 50. Retainer clip 58, while in an unlocked configuration, is then placed upon heatsink 54 such that clip bottom surface 118 rests on heatsink upper face 78.

To achieve this position a downward force will be applied to retainer clip 58 so that hooked members 94 can overcome the resistance provided by clip engagements 62. The rounded edges of hooked members 94 help to facilitate sliding past clip engagements 62. Alternatively, a pinching force may be applied to removal arm 98 and parallel cam arm 102 to provide a bend to clip body 82 and to thereby further separate the retaining arms 86, 90. In this manner, hooked members 94 may more easily be pushed past clip engagements 62. When hooked member 94 are in position relative to clip engagements 62 and when clip bottom surface 118 is resting upon heatsink upper face 78,

cam arm 102 may be rotated to a locked position to secure
heatsink 54 to CPU 30. To effect this rotation of cam arm
102, the resistances provided by unlock protrusions 146 and
lock protrusion 150 must be overcome with a sufficient
5 force.

To effect removal of retainer clip 58 from a locked
position cam arm 102 is rotated from the locked position,
generally parallel to clip body 82 to the unlocked
10 position, roughly parallel to removal arm 98. This is done
by overcoming the resistances provided by lock protrusions
150 and unlock protrusions 146. Once in the unlocked
position, runners 134 will no longer be securing heatsink
54 to retainer 50, and hooked members 94 should be
15 disengaged from clip engagements 62. If hooked members 94
are not disengaged from clip engagements 62 a downward
force may be applied to retainer clip 58 to achieve this
disengagement.

20 Next a pinching force is applied using removal arm 98
and now parallel cam arm 102. The pinching arm effects a
distortion of clip body 82 which acts to further separate
the retaining arms 86, 90. The separation of the retaining

arms 86, 90, and therefore the separation of hooked members 94, allows for easy lifting of hooked members 94 past clip engagements 62. Once hooked members 94 are clear of clip engagements 62, retaining clip 58 may be easily and
5 completely removed from the heatsink assembly. As noted above, an alternative embodiment would replace hooked member 94 with windowed cutouts and clip engagements 62 with fitted projections. However, operation of the retainer clip 58 would remain the same in this alternative
10 embodiment.

Due to the presence of the partially rotatable cam arm 102 and removal arm 98, removal of retainer clip 58 can be accomplished without the use of any tools, such as a
15 screwdriver or other prying instrument. The pinch removal system combined with the mechanically efficient hinged cam arm allows the use of a more powerful retainer clip, a necessity due to the increasing weight of heatsinks, while still allowing easy insertion and removal. In one
20 exemplary embodiment, the retainer clip of this application is capable of applying the 70 lbs. of force to securely hold a heatsink, thereby preventing a processor from pulling out in a drop test.

While the invention is susceptible to various
modifications and alternative forms, specific embodiments
have been shown by way of example in the drawings and have
5 been described in detail herein. However, it should be
understood that the invention is not intended to be limited
to the particular forms disclosed. Rather, the invention
is to cover all modifications, equivalents and alternatives
falling within the spirit and scope of the invention as
10 defined by the appended claims.